

Tesla's Strategy in 2020: Can It Deliver Sustained Profitability?



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Tesla shocked shareholders and Wall Street by reporting an operating loss of \$521.8 million and a net loss of \$702.1 million for the first quarter of 2019. But during the next three quarters of 2019, the company reported a number of significant improvements and achievements that signaled a major turning point in its prospects for competitive success and future profitability:

- Tesla delivered a record 112,095 electric vehicles to customers in Q4 of 2019. For full-year 2019, Tesla delivered a record 367,656 electric vehicles to customers, a 50 percent increase over the 245,530 vehicles delivered in 2018. Buyer demand for Tesla's models was so strong that the company spent zero dollars on advertising to achieve its record sales volumes.
- The company's automotive revenues rose from \$18.5 billion in 2018 to \$20.8 billion in 2019, and its free cash flows from operations (after paying for capital expenditures) jumped from -\$3.35 billion in 2017 to essentially \$0 in 2018 to \$1.1 billion in 2019.
- In January 2020, Tesla began ramping production of a soon-to-be-introduced Model Y at the company's Fremont assembly plant in California ahead of schedule; deliveries to customers were planned to begin in late March or early April. The new Model Y, an SUV version of Tesla's best-selling Model 3 sedan, was expected to become Tesla's most popular vehicle. Tesla CEO Elon Musk said that within a few years he expected that worldwide annual demand for Model 3 and Model Y would be on the order of 750,000 and 1.25 million units, respectively.
- The company announced improvements that boosted the single-charge EPA range on the all-wheel drive Model Y from 280 miles to 315 miles.
- Tesla began producing its Model 3 electric vehicle at a new assembly plant in Shanghai less than 10 months after beginning construction; vehicles produced at the Shanghai plant were expected to be delivered to buyers in China and other Asian countries. China was by far the world's largest market for motor vehicles, and sales of electric vehicles in China, which exceeded 1.4 million units in 2019, were the fastest-growing market segment.
- Tesla's engineering team discovered ways to greatly enhance the production and assembly techniques at the new Shanghai plant compared to those currently in use at the older Fremont plant; because of the resulting efficiency gains, unit production costs were expected to be about 25 percent below those at the Fremont plant.
- The company finalized plans for constructing a third assembly plant just outside Berlin, starting in February 2020; this plant was intended to supply vehicles to customers all across Europe, Scandinavia, and the Middle East.
- The company returned to profitability in the last two quarters of 2019, with net income of \$143 million in Q3 and \$105 million in Q4.
- Due to continuing improvements in operating efficiencies and higher operating leverage, the company's operating profit margin went from -11.5 percent in Q1 to -2.6 percent in Q2 to 4.1 percent in Q3 to 4.9 percent in Q4.

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Following the January 28, 2020 announcement of Tesla's 2019 financial results and its outlook for 2020, Tesla's stock price, which had already climbed from \$480 per share on January 3 to \$567 on January 28, exploded to an intra-day high of \$969 on February 19, 2020. Over the next two weeks, Tesla's stock price lost some of its gains, but still was trading around \$750 per share in the first week of March 2020. However, by June 2020, Tesla's stock price had surged again on prospects of a reopening of the global economy following widespread COVID-19 shutdowns, reaching an all-time high of \$1,027 on June 10.

Exhibit 1 shows sales of Tesla's four models from 2012 when the Model S was first introduced through the second quarter of 2020.

Company Background

Tesla Motors was incorporated in July 2003 by Martin Eberhard and Marc Tarpenning, two Silicon Valley engineers who believed it was feasible to produce an "awesome" electric vehicle. Tesla's namesake was the genius Nikola Tesla (1856–1943), an electrical engineer and scientist known for his impressive inventions (of which more than 700 were patented) and his contributions to the design of modern alternating-current (AC) power transmission

systems and electric motors. Tesla's first vehicle, the Tesla Roadster (an all-electric sports car) introduced in early 2008, was powered by an AC motor that descended directly from Nikola Tesla's original 1882 design.

Financing Early Operations. Eberhard and Tarpenning financed the company until Tesla's first round of investor funding in February 2004. Elon Musk contributed \$6.35 million of the \$6.5 million in initial funding and, as the company's majority investor, assumed the position of Chairman of the company's board of directors. Martin Eberhard put up \$75,000 of the initial \$6.5 million, with two private equity investment groups and a number of private investors contributing the remainder.¹ Several rounds of investor funding ensued, with Elon Musk emerging as the company's biggest shareholder. Other notable investors included Google co-founders Sergey Brin and Larry Page, former eBay President Jeff Skoll, and Hyatt heir Nick Pritzker. In 2009, Germany's Daimler AG, the maker of Mercedes vehicles, acquired an equity stake of almost 10 percent in Tesla for a reported \$50 million.² Daimler's investment was motivated by a desire to partner with Tesla to accelerate the development of Tesla's lithium-ion battery technology and electric drive train technology and to collaborate on electric cars being developed at

EXHIBIT 1 Tesla's Deliveries of the Model S, Model X, Model 3, and Model Y to Customers, 2012 through the Second Quarter of 2020

Period	Model S Deliveries	Model S plus Model X Deliveries	Model 3 Deliveries	Model 3 plus Model Y Deliveries
2012	2,653			
2013	22,477			
2014	31,655			
2015	50,332			
2016		76,230		
2017		101,420	1,734	
2018		99,475	146,055	
2019		66,771	300,885	
Q1 2020*		12,200		76,200
Q2 2020*		10,600		90,650

*Deliveries in Q1 and Q2 2020 were negatively impacted by the spread of the Coronavirus, which resulted in a government-mandated shutdown of the company's two assembly plants and a sharp falloff in buyer purchases of new motor vehicles due to stay-at-home restrictions in China, the United States, and many other countries.

Source: Company 10K reports, 2012–2019 and Tesla press releases, April 2, 2020 and July 2, 2020.

Mercedes. Later in 2009, Tesla was awarded a \$465 million low-interest loan by the U.S. Department of Energy to accelerate the production of affordable, fuel-efficient electric vehicles; Tesla used \$365 million for production engineering and assembly of its forthcoming Model S and \$100 million for a powertrain manufacturing plant employing about 650 people that would supply all-electric powertrain solutions to other automakers and help accelerate the availability of relatively low-cost, mass-market electric vehicles.

In June 2010, Tesla Motors became a public company, raising \$226 million with an initial public offering of common stock. It was the first American car company to go public since Ford Motor Company in 1956.

Management Changes at Tesla. In August 2007, with the company plagued by delays in getting its first model—the Tesla Roadster—into production, co-founder Martin Eberhard was ousted as Tesla's chief executive officer (CEO). While his successor managed to get the Tesla Roadster into production in March 2008 and begin delivering Roadsters to customers in October 2008, internal turmoil in the executive ranks prompted Elon Musk to decide it made more sense for him to take on the role as Tesla's chief executive officer—while continuing to serve as chairman of the board—because he was making all the major decisions anyway.

Elon Musk. Elon Musk was born in South Africa, taught himself computer programming, and, at age 12, made \$500 by selling the computer code for a video game he invented.³ In 1992, after spending two years at Queen's University in Ontario, Canada, Musk transferred to the University of Pennsylvania where he earned an undergraduate degree in business and a second degree in physics. During his college days, Musk spent some time thinking about two important matters that he thought merited his time and attention later in his career: one was that the world needed an environmentally clean method of transportation; the other was that it would be good if humans could colonize another planet.⁴ After graduating from the University of Pennsylvania, he decided to move to California and pursue a PhD in applied physics at Stanford; however, he left the program after two days to pursue his entrepreneurial aspirations instead.

Musk's first entrepreneurial venture was to join up with his brother, Kimbal, and establish Zip2, an

Internet software company that developed, hosted, and maintained some 200 websites involving “city guides” for media companies. In 1999 Zip2 was sold to a wholly-owned subsidiary of Compaq Computer for \$307 million in cash and \$34 million in stock options—Musk received a reported \$22 million from the sale.⁵

In March 1999, Musk co-founded **X.com**, a Silicon Valley online financial services and e-mail payment company. One year later, **X.com** acquired Confinity, which operated a subsidiary called PayPal. Musk was instrumental in the development of the person-to-person payment platform and, seeing big market opportunity for such an online payment platform, decided to rename **X.com** as PayPal. Musk pocketed about \$150 million in eBay shares when PayPal was acquired by eBay for \$1.5 billion in eBay stock in October 2002.

In June 2002, Elon Musk with an investment of \$100 million of his own money founded his third company, Space Exploration Technologies (SpaceX), to develop and manufacture space launch vehicles, with a goal of revolutionizing the state of rocket technology and ultimately enabling people to live on other planets. Upon hearing of Musk's new venture into the space flight business, David Sacks, one of Musk's former colleagues at PayPal, said, “Elon thinks bigger than just about anyone else I've ever met. He sets lofty goals and sets out to achieve them with great speed.”⁶ In 2011, Musk vowed to put a man on Mars in 10 years.⁷ In May 2012, a SpaceX Dragon cargo capsule powered by a SpaceX Falcon Rocket completed a near flawless test flight to and from the International Space Station; since then, under contracts with NASA, the SpaceX Dragon had delivered cargo to and from the Space Station multiple times. In early 2020, SpaceX was working toward launching a rocket and spacecraft in May 2029 carrying two American astronauts to the International Space Station, the first visit by American astronauts on an American rocket and spacecraft since July 2011. But, more significantly, SpaceX was making rapid progress on Elon Musk's ambitious Starlink project to provide high-speed broadband service worldwide via satellite by the end of 2020. Musk envisioned it might take a network of perhaps 12,000 Starlink satellites roughly the size of an office desk and weighing about 500 pounds orbiting about 375 miles above the earth to provide dense enough coverage to provide broadband service to every nook and cranny

on earth. As of April 2020, SpaceX had put up five batches of 60 satellites into orbit. Musk had tweeted after the launch of the third 60-satellite deployment that Starlink internet services would become available in the Northern United States and Canada after the completion of at least seven to nine 60-satellite deployments. After 22 launches, the company would be able to offer the service around the globe; Musk believed that if the Starlink network could capture as little as five percent of the global telecommunications market with its high-speed broadband service, SpaceX could net annual revenues of \$30 billion to \$50 billion. SpaceX had developed a fully and rapidly reusable Falcon rocket to power the Starlink launches (as well as other types of launches). Headquartered in Hawthorne, California, SpaceX had 7,000 employees and was owned by management, employees, and private equity firms; Elon Musk was the company's CEO and largest stockholder.

Another of Elon Musk's business ventures was SolarCity Inc., a full-service provider of solar system design, financing, solar panel installation, and ongoing system monitoring for homeowners, municipalities, businesses (including Intel, Walmart, Walgreens, and eBay), universities, nonprofit organizations, and military bases. Initially, investors were generally bullish on SolarCity's future prospects, and the company's stock price rose from about \$10.50 in late December 2012 to an all-time high of \$85 in March 2013. But when the company's losses continued to grow, investor sentiment cooled and SolarCity's stock price dropped to the \$16-\$20 range in February 2016. While Solar City had installed many solar energy systems and managed more solar systems for homes than any other solar company in the United States, its business model of recovering the capital and operating costs of the installed systems through leasing fees and power purchase agreements had resulted in negative cash flows and ever-larger net losses. In November 2016, to rescue SolarCity from probable bankruptcy, Tesla acquired the company for \$2.6 billion (the deal was approved by an 85 percent shareholder vote); SolarCity's operations were folded into a new division named Tesla Energy. However, the business model was changed to one where customers financed their new solar power installations with cash and loans, thus producing a healthier mix of upfront and recurring revenue; moreover, the costs of installing solar-powered installations were declining, partly because of improvements in solar

technology, greater efficiencies in manufacturing solar-generation systems, and cost savings achieved by operating Tesla's automotive and energy divisions as sister companies.

During 2008–2015, many business articles had been written about Musk's brilliant entrepreneurship in creating companies with revolutionary products that either spawned new industries or disruptively transformed existing industries. In a 2012 *Success* magazine article, Musk indicated that his commitments to his spacecraft, electric car, and solar panel businesses were long term and deeply felt.⁸ The author quoted Musk as saying, "I never expect to sort of sell them off and do something else. I expect to be with those companies as far into the future as I can imagine." Musk indicated he was involved in both Tesla's motor vehicle and energy businesses "because I'm concerned about the environment," while "SpaceX is about trying to help us work toward extending life beyond Earth on a permanent basis and becoming a multiplanetary species." The same writer described Musk's approach to a business as one of rallying employees and investors without creating false hope.⁹ The article quoted Musk as saying:

You've got to communicate, particularly within the company, the true state of the company. When people really understand it's do or die but if we work hard and pull through, there's going to be a great outcome, people will give it everything they've got.

Asked if he relied more on information or instinct in making key decisions, Musk said he made no bright-line distinction between the two.

Data informs the instinct. Generally, I wait until the data and my instincts are in alignment. And if either the data or my instincts are out of alignment, then I sort of keep working the issue until they are in alignment, either positive or negative.¹⁰

Musk was widely regarded as being an inspiring and visionary entrepreneur with astronomical ambition and willingness to invest his own money in risky and highly problematic business ventures. He set stretch performance targets and high product quality standards, and he pushed hard for their achievement. He exhibited perseverance, dedication, and an exceptionally strong work ethic—he typically worked 85 to 90 hours a week. Most weeks, Musk split his time between SpaceX and Tesla.

In 2019, Elon Musk's base salary as Tesla's CEO was \$62,400, an amount required by California's

minimum wage law; however, he was accepting only \$1 in salary. The company's Board of Directors in 2017 established an executive compensation plan for Musk tied to Tesla's performance on various metrics; compensation was in the form of stock option awards subject to various vesting conditions. As of January 2020, Musk reportedly owned about 34 million shares of Tesla common stock, equal to about 19 percent of the shares outstanding.¹¹

Musk's Vision and Strategy for Tesla. Elon Musk's strategic vision for the automotive segment of Tesla's operations featured three major elements:

1. **Bring a full-range of affordable electric-powered vehicles to market and become the world's foremost manufacturer of premium quality, high-performance electric vehicles.**
2. **Convince motor vehicle owners worldwide that electric-powered motor vehicles were an appealing alternative to gasoline-powered vehicles.**
3. **Accelerate the world's transition from carbon-producing, gasoline-powered motor vehicles to zero-emission electric vehicles.**

His strategic intent was for Tesla to be the world's biggest and most highly-regarded producer of electric-powered motor vehicles, dramatically increasing the share of electric vehicles on roads across the world and causing global use of gasoline-powered motor vehicles to fall into permanent long-term decline. At its core, therefore, Tesla's strategy was aimed squarely at utilizing the company's battery and electric drivetrain technology to disrupt the world automotive industry in ways that were sweeping and transformative. If Tesla's strategy proved to be as successful as Elon Musk believed it would be, industry observers expected that Tesla's competitive position and market standing vis-à-vis the world's best-known automotive manufacturers would be vastly stronger in 2025 than it was in 2020.

Tesla's Early Sales Successes with the Model S and Model X, 2012–2019.

In 2017 and 2018 production and sales of the company's trailblazing Model S sedan (introduced in 2012) and Model X sports utility vehicle (introduced in late 2015) were proceeding largely on plan. Combined sales of these two models were almost 101,500 units in 2017 and just under 100,000 units in 2018. Combined sales dropped to only 66,800 units in 2019, as many buyers shifted to purchasing

the lower-priced Model 3 (see Exhibit 1). Both the Model S and Model X were being sold in North America, Europe, and Asia in 2017–2020.

The Model S was a fully electric, four-door, five-passenger luxury sedan featuring all-wheel drive with dual front and rear motors (mounted on the front and rear axles), an all-glass panoramic roof, a top speed of 155 mph, the ability to accelerate from 0 to 60 mph in as little as 2.4 seconds, an estimated driving range of up to 390 miles on a single charge, a high definition backup camera, a 17-inch touchscreen that controlled most of the car's functions, keyless entry, xenon headlights, certain autopilot and self-driving capabilities, and numerous other features that were standard in most luxury vehicles.

The Model X was a sport utility vehicle with seating for up to seven adults, a top speed of 155 mph, the ability to accelerate from 0 to 60 mph in 4.4 seconds, an estimated driving range of 351 miles on a single charge, and a unique falcon wing door system for easy access to the second and third seating rows. The Model X also had an all-wheel drive dual motor system, adaptive air suspension, a premium interior and sound system, and autopilot capabilities, along with assorted other standard and optional features.

The Model S was the most-awarded car of 2013, including *Motor Trend's* 2013 Car of the Year award and *Automobile* magazine's 2013 Car of the Year award. The National Highway Traffic Safety Administration (NHTSA) in 2013, 2014, and 2015 awarded the Tesla Model S a five-star safety rating, both overall and in every subcategory (a score achieved by approximately one percent of all cars tested by the NHTSA). *Consumer Reports* gave the Model S a score of 99 out of 100 points in 2013, 2014, and 2015, saying it was "better than anything we've ever tested." However, the Tesla Model S did not make the *Consumer Reports* list of the "10 Top Picks" in 2016, 2017, and 2018, but the Model S did earn a perfect 100 score on the 2018 road test drive. In 2020 *Consumer Reports* gave the Model S a 97 on the 2020 road test drive and a #2 ranking among the top ten ultra-luxury cars; ratings for the Model X were considerably lower.

The sleek styling and politically correct power source of Tesla's Model S and Model X were thought to explain why thousands of wealthy individuals in countries where the two models were being sold—eager to be a part of the migration from gasoline-powered vehicles to electric-powered vehicles and to

publicly display support for a cleaner environment—had become early purchasers and advocates for Tesla's vehicles. Indeed, word-of-mouth praise among current owners and glowing articles in the media were so pervasive that Tesla had not yet spent any money on advertising to boost customer traffic in its showrooms. In a presentation to investors, a Tesla officer said "Tesla owners are our best salespeople."¹²

Tesla's Excruciating Struggle to Boost Production Volumes of the Model 3.

Tesla Motors began assembling the first models of its new "affordably-priced" entry-level Model 3 electric car in May 2017 and delivered the first units the last week of July. The first production vehicles, delivered to employees who had placed pre-production reservations over a year earlier, were pre-configured with rear-wheel drive and a long-range battery, had a range of 310 miles and 0 to 60 mph acceleration time of 5.1 seconds and had a sticker price starting at \$44,000 with premium upgrades available for an additional \$5,000 to \$10,000.

Tesla unveiled six drivable prototypes of the Model 3 for public viewing and a limited number of test drives on the evening of March 31, 2016. Buyer reaction was overwhelmingly positive. Over the next two weeks, some 350,000 individuals paid a \$1,000 deposit to reserve a place in line to obtain a Model 3; reportedly, the number of reservations grew to nearly 400,000 units over the next several months. Because of the tremendous amount of interest in the Model 3, Tesla advanced the schedule to begin producing the Model 3 to mid-2017 and further accelerated its efforts to expand production capacity of the Model 3.

In early August 2017, Musk said:¹³

Based on our preparedness at this time, we are confident we can produce just over 1,500 [Model 3] vehicles in Q3 and achieve a run rate of 5,000 vehicles per week by the end of 2017. We also continue to plan on increasing Model 3 production to 10,000 vehicles per week at some point in 2018.

But in his third quarter 2017 update on November 1, 2017, Musk related a host of production bottlenecks and challenges that were blocking the ramp-up of Model 3 production and delaying deliveries, saying, "this makes it difficult to predict exactly how long it will take for all bottlenecks to be cleared or when new ones will appear."¹⁴

Tesla's "production hell" with the Model 3 continued to haunt the company well into 2018. Many

analysts believed Tesla's problems stemmed from having taken huge shortcuts in the parts approval process, production line validation, and full beta testing of the Model 3 in order to begin early assembly and production ramp-up. There were other reasons, including ongoing parts bottlenecks and reportedly inconsistent manufacturing quality. Production line employees interviewed by reporters indicated significant numbers of units coming off the assembly line had quality problems involving malfunctioning parts/components and/or faulty installation issues that required reworking. In early 2018, a big parking lot just outside the assembly plant in Fremont, California, was said to be full of Model 3s awaiting corrective attention; a few were even being junked because of the high cost of restoring them to a condition that would pass final pre-delivery inspection. On February 7, 2018, Musk reported:¹⁵

We continue to target weekly Model 3 production rates of 2,500 by the end of Q1 and 5,000 by the end of Q2. It is important to note that while these are the levels we are focused on hitting and we have plans in place to achieve them, our prior experience on the Model 3 ramp has demonstrated the difficulty of accurately forecasting specific production rates at specific points in time. What we can say with confidence is that we are taking many actions to systematically address bottlenecks and add capacity in places like the battery module line where we have experienced constraints, and these actions should result in our production rate significantly increasing during the rest of Q1 and through Q2.

A week or so later, Tesla shut down the Model 3 assembly line for four days to address some of the problems being encountered. Nonetheless, in early March 2018, there were reports from multiple sources that Tesla had not been able to consistently achieve a production run rate of 800 units per week. Musk's target of a weekly production rate of 2,500 Model 3s by the end of March proved unachievable. During the last week of March, Elon Musk tweeted that he had taken over the role of supervising Model 3 production for the time being.

The first week of April 2018, Tesla reported that it produced 34,494 vehicles in the first quarter of 2018 and delivered 29,980 vehicles, of which 11,730 were Model S; 10,070 were Model X; and 8,180 were Model 3. The company said that after shifting some production resources away from Model S and Model X production over to production and assembly of the Model 3 during the last week of March, it

was able to produce 2,020 Model 3s in the last seven days leading up to April 3. In its production and delivery announcement, the company further said:

Given the progress made thus far and upcoming actions for further capacity improvement, we expect that the Model 3 production rate will climb rapidly through Q2. Tesla continues to target a production rate of approximately 5,000 units per week in about three months.

Finally, we would like to share two additional points about Model 3:¹⁶

- The quality of Model 3 coming out of production is at the highest level we have seen across all our products. This is reflected in the overwhelming delight experienced by our customers with their Model 3s. Our initial customer satisfaction score for Model 3 quality is above 93 percent, which is the highest score in Tesla's history.
- Net Model 3 reservations remained stable through Q1. The reasons for order cancellation are almost entirely due to delays in production in general and delays in availability of certain planned options, particularly dual motor AWD and the smaller battery pack.

While progress was finally being made in boosting Model 3 production volumes, Tesla still had to prove it could overcome three challenges with the potential to imperil Musk's vision for the company:

1. Gasoline prices across much of the world had dropped significantly from 2015 to early 2018 and were expected by many knowledgeable observers to remain permanently "low" because crude oil prices worldwide were expected to stay below \$80 per barrel, in part due to the growing abundance of shale oil and the sharply-lower costs of extracting oil from shale deposits. Affordable gasoline prices made the purchase of electric vehicles less attractive, given that (1) electric vehicles were higher priced than vehicles with gasoline engines, (2) electric vehicles so far were limited to an upper range of about 300 miles on a single battery charge, and (3) new vehicles powered by gasoline engines were getting more miles per gallon (due to government-mandated mileage-efficiency requirements).
2. Tesla was facing the prospect of much more formidable competition from virtually all of the world's major motor vehicle manufacturers (BMW, Mercedes-Benz, Jaguar, Volkswagen-Audi, Toyota,

Honda, Nissan, General Motors, and Ford) that were rushing to introduce affordable and high-end electric vehicles with features and engine configurations that would enable them to compete head-on with the Model S, Model X, and Model 3. Several vehicle makers were also pursuing the development of electric-powered semitrucks for commercial uses.

3. Tesla had yet to prove it could boost operating efficiency and lower costs enough to be both price competitive and attractively profitable in producing and marketing its vehicle models. It reported both a loss from operations and a net loss during 2013–2017, despite growing its automotive sales and leasing revenues from \$2.61 billion in 2013 to \$9.64 billion in 2017. In February 2018, the company did say it expected to generate a positive quarterly operating income before the end of 2018 (but not a positive operating income for the year). While Tesla's ongoing operating losses and net losses were partly, or perhaps largely, due to the sizable new product development costs associated with the Model X and Model 3 and to the required accounting treatments for both leased vehicles and Tesla's generous stock compensation plan, it was nonetheless disconcerting that Tesla's operating loss of \$1.63 billion in 2017 was the largest in the company's history and its 2017 operating profit per vehicle sold was a negative \$15,855.¹⁷

When Tesla announced its financial and operating results for the first quarter of 2018 ending March 31, Elon Musk said that after numerous adjustments in assembly methods and correcting problems with faulty and improperly designed parts Tesla was now able to sustain a production rate of 3,000 Model 3s per week. He also said that continued refinements of the assembly process and improved operational uptime of the associated machinery should lead to a production rate of "well over 5,000" vehicles per week by the end of June or beginning of July. Musk admitted that he had been wrong in mandating use of so many robots along the assembly line, and that now the assembly line had been and was still being greatly simplified, with more use being made of semi-automated and manual assembly to perform certain tasks until the company had enough time to perfect the use of robots and enable full automation to resume. Musk confidently predicted that the Model 3 would become the best-selling medium-sized

premium sedan in the United States before year end and that, if Tesla executed according to plan, the company would achieve positive cash flows and positive net income (excluding non-cash stock-based compensation) in both the third and fourth quarters of 2018.¹⁸ During the May 2, 2018 conference call with analysts to discuss Tesla's Q1 2018 financial results, Musk expressed his appreciation to the

Chinese government for its announcement that foreign companies would henceforth be allowed to have 100 percent ownership of manufacturing facilities in China and said Tesla could have a Gigafactory capable of vehicle production in China "not later than the fourth quarter" of 2018.¹⁹

Exhibit 2 presents selected financial statement data for Tesla for 2015 through 2019.

EXHIBIT 2 Selected Financial Data for Tesla, Inc., Years Ended December 31, 2015-2019 (in millions, except per share data)

	Years Ended December 31				
	2015	2016	2017	2018	2019
Income Statement Data:					
Revenues:					
Automotive sales	\$3,432	\$5,589	\$ 8,535	17,632	\$19,952
Automotive leasing	309	762	1,107	883	869
Total automotive revenues	3,741	6,351	9,642	18,515	20,821
Energy generation and storage	14	181	1,116	1,555	1,531
Services and other	291	468	1,001	1,391	2,226
Total revenues	4,046	7,000	11,759	21,461	24,578
Cost of revenues:					
Automotive sales	2,640	4,268	6,724.5	13,686	15,939
Automotive leasing	183	482	708	488	459
Total automotive cost of revenues	2,823	4,750	7,433	14,174	16,398
Energy generation and storage	12	178	874	1365	1,341
Services and other	287	472	1,229	1,880	2,770
Total cost of revenues	3,123	5,401	9,536	17,419	20,509
Gross profit (loss)	924	1,599	2,223	4,042	4,069
Operating expenses:					
Research and development	7,189	834	1,378	1,460	1,343
Selling, general and administrative	922	1,432.	2,477	2,834.5	2,646
Restructuring and other	—	—	—	135	149
Total operating expenses	1,640	2,267	3,855	4,430	4,138
Loss from operations	(717)	(667)	(1,632)	(388)	(69)
Interest income	2	9	19	24	44
Interest expense	(119)	(199)	(471)	(663)	(685)
Other income (expense), net	(42)	111	(125)	22	45
Loss before income taxes	(876)	(746)	(2,209)	(1,005)	(665)
Provision for income taxes	13	27	32	58	110
Net loss	\$ (889)	\$ (773)	\$ (2,241)	\$ (1,063)	\$ (775)
Net loss attributable to noncontrolling interests and subsidiaries	—	(98)	(279)	(87)	87

(continue)

EXHIBIT 2 Selected Financial Data for Tesla, Inc., Years Ended December 31, 2015–2019 (in millions, except per share data) (continued)

	Years Ended December 31				
	2015	2016	2017	2018	2019
Net loss attributable to common shareholders	\$ (889)	\$ (675)	\$ (1,962)	\$ (976)	\$ (862)
Net loss per share of common stock, basic and diluted	\$ (6.93)	\$ (4.68)	\$ (11.83)	\$ (5.72)	\$ (4.92)
Weighted average shares used in computing net loss per share of common stock, basic and diluted	128	144	166	171	177
Selected Balance Sheet Data:					
Cash and cash equivalents	\$ 1,197	\$ 3,393	\$ 3,368	\$ 3,686	\$ 6,286
Inventory	1,278	2,067	2,264	3,113	3,552
Total current assets	2,791	6,260	6,571	8,307	12,103
Property, plant, and equipment, net	3,403	5,983	10,028	11,330	10,396
Total assets	8,093	22,664	28,655	29,740	34,309
Total current liabilities	2,816	5,827	7,675	9,992	10,667
Long-term debt and capital leases, net of current portion	2,040	5,860	9,418	9,404	11,634
Total stockholders' equity	1,089	4,753	4,237	4,923	6,618
Selected Cash Flow Data:					
Cash flows provided by (used in) operating activities	\$ (524)	\$ (124)	\$ (61)	\$ 2,098	\$ 2,405
Proceeds from issuance of common stock in public offerings	730	1,702	400		848
Proceeds from issuance of convertible and other debt	319	2,853	7,138	6,176	10,669
Purchases of property and equipment excluding capital leases	(1,635)	(1,281)	(3,415)	(2,101)	(1,327)
Net cash used in investing activities	(1,674)	(1,081)	(4,196)	(2,337)	(1,436)
Net cash provided by financing activities	1,524	3,744	4,415	574	1,529

Sources: Company 10-K reports for 2015, 2017, 2018, and 2019.

Tesla in 2020

In 2020 Tesla's business consisted of designing, developing, manufacturing, and leasing high-performance fully electric vehicles, and energy generation and storage systems; it also offered services related to its products.²⁰ The company considered itself to be the world's first vertically integrated sustainable energy company, offering end-to-end clean energy products, including generation, storage and consumption. Tesla products were generally sold directly to customers at its website and selected retail locations and, in some cases, by an internal salesforce. To serve customers, Tesla had invested in a global network of vehicle service centers, Mobile Service technicians, body shops, Supercharger stations, and Destination Chargers to accelerate the widespread adoption of its

battery-powered electric vehicles our products and help promote the transition from gasoline-powered motor vehicles to zero emission electric vehicles.

Tesla currently offered or was planning to offer a wide range of technologically advanced, attractively styled, high-performance consumer and commercial vehicles. To differentiate its business and vehicles from other vehicle manufacturers, Tesla was aggressively striving to be the leader, or at worst among the leaders, in introducing full self-driving capability for all of its models to complement such existing features as leading mileage range on a single charge, superior acceleration, handling and safety performance, user convenience and infotainment packages, the ability to have additional features enabled through over-the-air software updates; and savings in charging, maintenance and other costs of ownership. technology

for improved safety. In addition, Tesla was striving to lower the cost of ownership for our customers through continuous efforts to reduce manufacturing costs of its vehicles.

In furtherance of its mission to accelerate the world's transition to sustainable energy, Tesla had also developed an expertise in solar energy systems. It sold and leased solar energy systems for residential and commercial customers, and it offered a Solar Roof product, which featured attractive and durable glass roof tiles integrated with solar energy generation. Tesla's approach to the solar business emphasized simplicity, standardization, and accessibility to make it easy and cost-effective for customers to adopt clean energy.

Finally, Tesla had leveraged its technological expertise in batteries, energy management, power electronics, and integrated systems associated with its vehicle powertrain systems to develop and manufacture energy storage products, including Powerwall, Powerpack and Megapack. These scalable systems could be used in homes, commercial facilities, and on the utility grid, and were capable of numerous applications including backup or off-grid power, peak demand reduction, demand response, reducing intermittency of renewable energy generation, and facilitating the use of renewable energy generation over fossil fuel generation, and other grid services and wholesale electric market services. Tesla's solar business expertise enabled it to offer integrated systems that combined energy generation and energy storage. As with Tesla's vehicles, the company's energy storage products could be remotely updated over-the-air with software or firmware improvements.

Funding Its Rapidly Expanding Business Operations. During 2014–2017, Tesla raised billions of dollars via the sale of senior notes convertible into common stock, other types of long-term debt, and issues of new common stock to provide funding for research and development (R&D), the development of new models, expanded production capabilities, an ever-growing network of recharging stations, retail showrooms, vehicle service centers, and its energy product operations. Tesla's long-term debt and contractual capital lease obligations grew from \$600 million at year-end 2013 to \$11.6 billion at year-end 2019; and the number of shares of common stock outstanding rose from 119 million to 177 million during the same period. In recent years, Tesla burned through cash

at a torrid pace because of the heavy expenses it was incurring for design and engineering, gearing up to produce certain parts and component systems internally, constructing new facilities, equipping vehicle assembly lines with robotics technology, tools, and other machinery, and boosting its employee count from almost 6,000 employees at year-end 2013 to just over 48,000 at year-end 2019. The new Gigafactory in Shanghai, China, was being almost fully funded with local debt.

Tesla's Strategy to Become the World's Biggest and Most Highly Regarded Producer of Electric Vehicles

In 2020, Tesla's strategy and operating initiatives were focused on:

- Continuing to ramp up production of the Model 3 at both the Shanghai plant and the Fremont plant.
- Ramping up the production of the new Model Y SUV at both the Shanghai plant and the Fremont plant and beginning deliveries to customers in April 2020.
- Expanding the production capacity of certain automobile parts (battery packs, electric motors, motor controllers, cooling pipes) at the Shanghai plant to help localize its supply chain for vehicles produced in China; it was also building a second stamping line to speed up car production at the plant.
- Adding more production capacity at the Fremont plant so as to enable the production of 90,000 Model S and Model X vehicles and 400,000 Model 3 and Model Y vehicles.
- Finishing construction on the second phase of the assembly plant in Shanghai, with a goal of having 300,000 units of total production capacity (150,000 for Model 3 and 150,000 for Model Y) in place by year-end 2020 or early 2021.
- Moving quickly to construct and equip its third assembly plant in Germany in order to begin production of Model 3 and Model Y in the first quarter of 2021.
- Continuing to refine the designs and development of its next three models.
- Continuing to expand the numbers of sales and service locations, mobile service vehicles and Supercharger stations across the world.

- Continuing to develop the technologies, systems, and software to achieve full self-driving capabilities for all Tesla vehicles.
- Selecting sites in the United States for two new manufacturing and assembly plants—one for producing the Model Y and one for producing a new pickup truck.

Product Line Strategy.

A key element of Tesla's long-term strategy was to offer vehicle-buyers a full line of electric vehicle options. So far Tesla had introduced four models—the Tesla Roadster, Model S, Model X, and Model 3. Aggressive efforts were underway to get the Model Y into the marketplace in Spring 2020, along with a limited number of Tesla Semi trucks. These were scheduled to be followed by a Tesla Semi truck, a new pickup-up truck called the Cybertruck, and a fresh Roadster 2 model.

Tesla's First Vehicle—The Tesla Roadster. Following Tesla's initial funding in 2004, Musk took an active role within the company. Although he was not involved in day-to-day business operations, he nonetheless exerted strong influence in the design of the Tesla Roadster, a two-seat convertible that could accelerate from 0 to 60 miles per hour in as little as 3.7 seconds, had a maximum speed of about 120 miles per hour, could travel about 245 miles on a single charge, and had a base price of \$109,000. Musk insisted from the beginning that the Roadster have a lightweight, high-strength carbon fiber body, and he influenced the design of components of the Roadster ranging from the power electronics module to the headlamps and other styling features.²¹ Prototypes of the Roadster were introduced to the public in July 2006. The first "Signature One Hundred" set of fully equipped Roadsters sold out in less than three weeks; the second hundred sold out by October 2007. General production began in March 2008. New models of the Roadster were introduced in July 2009 (including the Roadster Sport with a base price of \$128,500) and in July 2010. Sales of Roadster models to countries in Europe and Asia began in 2010. From 2008 through 2012, Tesla sold more than 2,450 Roadsters in 31 countries.²² Sales of Roadster models ended in December 2012 so that the company could concentrate exclusively on producing and marketing the Model S. However, Tesla announced in early 2015 that Roadster owners would be able to obtain a Roadster 3.0 package that enabled

a 40 to 50 percent improvement in driving range to as much as 400 miles on a single charge; management indicated additional updates for Roadsters would be forthcoming. In 2017, Tesla announced it would re-introduce a new version of the Roadster in 2020 (after it began deliveries of the Tesla Semi truck and Model Y).

Tesla's Second Vehicle—The Model S. Customer deliveries of Tesla's second vehicle—the sleek, eye-catching Model S sedan—began in July 2012. Tesla introduced several new options for the Model S in 2013, including a sub-zero weather package, parking sensors, upgraded leather interior, several new wheel options, and a yacht-style center console. Later, Xenon headlights, a high definition backup camera, emergency braking, collision warning, blind-spot monitoring, and various autopilot and self-driving capabilities became standard equipment on all Model S cars. The Model S powertrain options had been modified several times. In March 2020, the Model S was being offered with two powertrains options:

- Long Range Plus — all-wheel drive with dual front and rear motors (mounted on the front and rear axles), 390-mile driving range, 0 to 60 mph in 3.7 seconds, with a standard price of \$79,990 (which included adaptive air suspension, premium interior and sound, and free unlimited supercharging)
- Performance — all-wheel drive with dual front and rear motors (mounted on the front and rear axles), 348-mile driving range, 0 to 60 mph in 2.4 seconds, with a standard price of \$94,990 (which included adaptive air suspension, enhanced interior styling, premium sound, and free unlimited supercharging)

Popular options included premium exterior colors (up to \$2,000), 21" sonic carbon twin turbine wheels (\$2,500), a full-self-driving computer, with online activation of new self-driving capabilities as regulatory approval was granted (\$7,000); and third-row, rear-facing seating (\$4,000). All Model S vehicles (as well as all other Tesla models) previously delivered to customers were equipped to receive software updates from Tesla that included new and updated features. Autopilot software features were updated and upgraded as fast as they were developed and tested.

To counter the "range anxiety" that Tesla owners sometimes experienced, in 2018 Tesla introduced a standard software feature called "Range Assurance,"

an always-running application within the car's navigation system that kept tabs on the vehicle's battery charge-level and the locations of Tesla Supercharging stations and parking-spot chargers in the vicinity. When the vehicle's battery began running low, an alert appeared on the navigation screen, along with a list of nearby Tesla Supercharger stations and public charging facilities; a second warning appeared when the vehicle was about to go beyond the radius of nearby chargers without enough juice to get to the next facility, at which point drivers were directed to the nearest charge point. There was also a Trip Planner feature that enabled drivers to plan long-distance trips based on the best locations for recharging both en route and at the destination; during travel, the software was programmed to pull in new data about every 30 seconds, updating to show which charging facilities had vacancies or were full.

In the United States, customers who purchased a Model S (or any other Tesla model) before 2019 were eligible for a federal tax credit of up to \$7,500. A number of states also offered rebates on electric vehicle purchases, with states like California and New York offering rebates as high as \$7,500. Customers who leased a Model S were not entitled to rebates. Legislation authorizing the federal tax credit called for the tax credits on a manufacturer's electric vehicles to expire once the manufacturer's cumulative sales of electric vehicles reached 200,000 units. Bills had been introduced in Congress to extend the credits past a cumulative sales volume of 200,000 units, but none of these had passed.

Tesla's Third Vehicle—The Model X Crossover SUV. To reduce the development costs of the Model X, Tesla had designed the Model X so that it could share about 60 percent of the Model S platform. The Model X had seating for up to 7 adults, dual electric motors that powered an all-wheel drive system, and a driving range of about 351 miles per charge. The Model X's distinctive "falcon-wing doors" provided easy access to the second and third seating rows, resulting in a profile that resembled a sedan more than an SUV. The drive train options for the Model X in 2020 were the same as for the Model S, but the driving ranges and acceleration times for the Model X were different from those of the Model S. In 2018, the standard price for the Long Range Plus Model X was \$84,990; the standard price for the Performance Model X was \$104,990. The options were essentially similar to the Model S

except for the seating; five-passenger seating was standard, a six-seat interior cost \$6,500, and a seven-seat interior cost \$3,500. Options for the Model X could boost the price to \$127,990. The Model X was the first SUV ever to achieve a five-star safety rating in every category and sub-category; it had both the lowest probability of occupant injury and a rollover risk half that of any SUV on the road.

Tesla's Fourth Vehicle—The Model 3. The idea behind the Model 3 was to incorporate all the company had learned from the development and production of the Roadster, Model S, and Model X to create the world's first mass market electric vehicle priced on par with its gasoline-powered equivalents. The Model 3 was attractively styled, with seating for five adults, a driving range of 250 miles with rear-wheel drive, a driving range of up to 322 miles with dual motor all-wheel drive, 0 to 60 mph acceleration capability of 3.2 seconds to 5.3 seconds depending on the model and drive train selected, and a five-star safety rating. While the stated base price was \$39,990, the range of available upgrades and options could up the price to \$66,990. The average selling price of the Model 3 in 2018 exceeded \$45,000 and, as of June 2019 Tesla had produced very few of the base-price Model 3 versions (since it was far more profitable to sell more fully equipped Model 3s).

In the United States, federal legislation provided that buyers of electric vehicles were eligible for a federal tax credit of up to \$7,500 based on the size of the vehicle's electric battery. Buyers who leased an electric vehicle were not eligible for the tax credit (the credit went to the company offering the lease). However, there was a provision in the law stating that once the *cumulative* sales volume of a manufacturer's zero-emission vehicles in the United States reached 200,000 vehicles, the size of the \$7,500 federal tax credit entered a one-year phase-out period where buyers of qualifying vehicles were "eligible for 50 percent of the credit if acquired in the first two quarters of the phase-out period and 25 percent of the credit if acquired in the third or fourth quarter of the phase-out period."²³ Purchasers of that manufacturer's vehicles were not eligible for any federal tax credit after the phase-out period. Tesla's cumulative sales in the United States exceeded 200,000 vehicles during 2018. Some states also offered tax credits for the purchases of plug-in electric vehicles. Some states also offered a variety of tax credits in addition to the federal tax credit. The governments of China,

Japan, Norway, United Kingdom, and several other European countries offered tax incentives for electric vehicle purchases as well. In 2018, Canada discontinued the use of incentives for electric vehicles with a manufacturer's suggested list price of price greater than C\$75,000 (US\$58,500) and Norway phased out its tax credits as well.

Tesla's Fifth Vehicle—The Model Y Crossover SUV. In 2017, Elon Musk announced that Tesla had begun developing plans for the development and production of an all-electric crossover SUV that would be built on the same platform as the Model 3, but like the Model X would have seating for up to 7 adults. Tesla unveiled a prototype of its Model Y SUV in March 2019. In early 2020, the Model Y vehicles being offered for sale included dual motor Long-Range and Performance versions, a driving range of about 315 miles, a top speed of 135 mph and 0 to 60 mph acceleration of 4.8 seconds for the Long Range version and a top speed of 145 mph and 0-60 mph acceleration of 3.5 seconds for the Performance version. Base prices were \$52,990 and \$60,990, respectively for the two versions, while fully equipped versions had price tags of \$67,990 and \$73,990, respectively.

In May 2018, while Tesla was struggling with all of its Model 3 production problems, Musk said he was planning for production of the Model Y to be a "manufacturing revolution," with a simplified manufacturing process and greater use of robots.²⁴ Because the Model Y was expected to appeal to a large market segment, Elon Musk expected that the Model Y would ultimately have higher annual sales than Model S, Model X, and Model 3 combined.

The Tesla Semi-Truck. Mention was made of a semi-truck in Tesla's 2016 master plan. But behind the scenes Tesla had moved swiftly to come up with not only a design but also prototypes. The Semi was unveiled with much fanfare at a press conference on November 16, 2017. The company described the Semi as a Class 8 semi-trailer truck prototype that would be powered by four independent electric motors on rear axles; have a driving range of either 300 miles or 500 miles on a full charge; and have a centered driver's seat in the cockpit, with touch screen controls on either side of the steering wheel. Standard equipment on all models would include Autopilot capabilities, automatic emergency braking, automatic lane keeping, forward collision warning, and ability to enter an energy-saving "convoy mode"

with other semis on the road. Elon Musk said the 500-mile version, equipped with Tesla's latest battery design, would be able to run for 400 miles after an 80 percent charge in 30 minutes using a solar-powered Tesla Megacharger charging station. He also said the Semi would be able to accelerate from 0 to 60 mph in seconds unloaded and in 20 seconds fully loaded. Tesla expected to offer a warranty for a million miles and said maintenance would be simpler than for a diesel truck.

A week later, Musk said that the regular production versions for the 300-mile range version of the Semi would be priced at \$150,000 and the 500-mile range version would be priced at \$180,000; the company also said it planned to offer a Founder's Series Semi at \$200,000. Scores of companies, including Walmart, United Parcel Service, Anheuser-Busch, J.B. Hunt Trucking Co, and PepsiCo, immediately lined up to place pre-orders for 5 to 150 Semis (at an initial reservation price of \$5,000, which was quickly raised to \$20,000 per reservation) so they could conduct tests of how well the Semi would perform in their operations. In March 2018, Tesla began testing the Semi with real cargo, hauling battery packs from Gigafactory 1 in Nevada to the Tesla Factory in Fremont, California. Pictures of the Semi being loaded with cargo at the Nevada Gigafactory and traveling on the highways were immediately publicized in the media and posted on the Internet and social media. Production of the Semi was originally scheduled to begin in 2019, but in early 2020 it appeared that production of the Semi was on pause until sometime in 2021 at best because mileage tests showed the battery pack originally planned for use in the truck was not able to achieve the targeted range of 300-to-500 miles on a single charge. More powerful battery packs capable of achieving the targeted range were under development. In June 2020, Elon Musk said getting the Tesla Semi into production was a top priority; however, the company was only in the final stage of choosing a site to construct a facility to manufacture and assemble the Semi.

The Tesla Pickup Truck. While Elon Musk began talking about Tesla making an all-electric pickup truck (and an all-electric cargo van on the same chassis) in 2016, the company had yet to finalize its design and production specifications for what it was calling the Cybertruck. Elon Musk said in a June 2019 podcast that Tesla wanted to keep the Cybertruck's starting price below \$50,000 and make sure the truck was

highly functional from a load-carrying standpoint, saying:²⁵

It's going to be a truck that is more capable than other trucks. The goal is to be a better truck than a [Ford] F-150 in terms of truck-like functionality and be a better sports car than a standard [Porsche] 911. That's the aspiration.

Musk went on to say that the truck's appearance would be pretty sci-fi and not be for everyone. Further, buyers of the truck would have a range of optional extras that could push the price up close to \$70,000 (on a par with current roomy, luxurious pickups with powerful engines). The Tesla Cybertruck was unveiled at the company's Tesla Design Studio in California in November 2019. Some people loved the futuristic design, others hated it, and many thought it was too far over the top. Tesla did not respond to questions about whether the truck's design would change before it went into production. In March 2020, Elon Musk announced that Tesla was in the process of evaluating sites in the central United States for a new plant to manufacture and assemble its new Cybertruck; the current plan was to begin production in late 2021.

Distribution Strategy: A Company-Owned and Operated Network of Retail Stores and Service Centers.

Tesla sold its vehicles directly to buyers and also provided them with after-sale service through a network of company-owned sales galleries and service centers. This contrasted sharply with the strategy of rival motor vehicle manufacturers, all of whom sold vehicles and replacement parts at wholesale prices to their networks of franchised dealerships that in turn handled retail sales, maintenance and service, and warranty repairs. Management believed that integrating forward into the business of traditional automobile dealers and operating its own retail sales and service network had three important advantages:

1. *The ability to create and control its own version of a compelling buying customer experience*, one that was differentiated from the buying experience consumers had with sales and service locations of franchised automobile dealers. Having customers deal directly with Tesla-employed sales and service personnel enabled Tesla to (a) engage and inform potential customers about electric vehicles in general and the advantages of owning a Tesla in particular and (b) build a more personal relationship

with customers and, hopefully, instill a lasting and favorable impression of Tesla Motors, its mission, and the caliber and performance of its vehicles.

2. *The ability to achieve greater operating economies in performing sales and service activities*. Management believed that a company-operated sales and service network offered substantial opportunities to better control inventory costs of both vehicles and replacement parts, manage warranty service and pricing, maintain and strengthen the Tesla brand, and obtain rapid customer feedback.
3. *The opportunity to capture the sales and service revenues of traditional automobile dealerships*. Rival motor vehicle manufacturers sold vehicles and replacement parts at wholesale prices to their networks of franchised dealerships that in turn handled retail sales, maintenance, and service, and warranty repairs. But when Tesla buyers purchased a vehicle at a Tesla-owned sales gallery, Tesla captured the full retail sales price, roughly 10 percent greater than the wholesale price realized by vehicle manufacturers selling through franchised dealers. And, by operating its own service centers, it captured service revenues not available to vehicle manufacturers who relied upon their franchised dealers to provide needed maintenance and repairs. Furthermore, Tesla management believed that company-owned service centers avoided the conflict of interest between vehicle manufacturers and their franchised dealers where the sale of warranty parts and repairs by a dealer were a key source of revenue and profit for the dealer but where warranty-related costs were typically a substantial expense for the vehicle manufacturer.

Tesla Sales Galleries and Showrooms. Initially, Tesla's distribution strategy was to aggressively expand its network of sales galleries and service centers to broaden its geographical presence and to provide better maintenance and repair service in areas with a high concentration of Tesla owners. In 2013, Tesla began combining its sales and service activities at a single location (rather than having separate locations, as earlier had been the case); experience indicated that combination sales and service locations were more cost-efficient and facilitated faster expansion of the company's retail footprint. At the end of 2019, Tesla had 429 sales and service locations, mostly in or near major metropolitan areas in the United States, Europe, China, and selected other

countries. Some were in prominent regional shopping malls and others were on highly visible sites along busy thoroughfares. Most sales locations had only several vehicles in stock that were available for immediate sale. The vast majority of Tesla buyers, however, preferred to customize their vehicle by placing an order via the Internet, frequently while in a sales gallery.

In the United States, there was a lurking threat to Tesla's strategy to bypass distributing through franchised Tesla dealers and sell directly to consumers. Going back many years, franchised automobile dealers in the United States had feared that automotive manufacturers might one day decide to integrate forward into selling and servicing the vehicles they produced. To foreclose any attempts by manufacturers to compete directly against their franchised dealers, automobile dealers in every state in the United States had formed statewide franchised dealer associations to lobby for legislation blocking motor vehicle manufacturers from becoming retailers of new and used cars and providing maintenance and repair services to vehicle owners. Legislation either forbidding or severely restricting the ability of automakers to sell vehicles directly to the public had been passed in 48 states; these laws had been in effect for many years, and franchised dealer associations were diligent in pushing for strict enforcement of these laws.

As sales of the Model S rose briskly from 2013 to 2015 and Tesla continued opening more sales galleries and service centers, both franchised dealers and statewide dealer associations became increasingly anxious about "the Tesla problem" and what actions to take to block Tesla's sell-direct strategy. Dealers and dealer trade associations in a number of states were openly vocal about their concerns and actively began lobbying state legislatures to consider either enforcement actions against Tesla or amendments to existing legislation that would bring a halt to Tesla's efforts to sell vehicles at company-owned showrooms. A host of skirmishes ensued in 12 states. In several cases, settlements were reached that allowed Tesla to open a select few sales locations, but the numbers were capped. In states where manufacturer-direct sales to consumers were expressly prohibited, Tesla was allowed to have sales galleries, service centers, and Supercharger locations—but was prevented from using its sales galleries to take orders, conduct test drives, deliver cars, or discuss pricing with potential buyers. Buyers in these states could place an order

via the Internet, specify when they would like the car to arrive, and then either have it delivered to a nearby Tesla service center for pickup or have it delivered directly to their home or business location.

Tesla Announces Sales Gallery Closures and a Shift to Online Sales. In February 2019, Tesla unexpectedly announced it was closing most of its sales galleries in malls and shopping centers and would begin to sell its cars only online. The shift was made partly to reduce employee headcount and operating expenses and partly to relax lobbying efforts in states that did not permit manufacturers to own and operate their own dealerships. As part of the shift, new owners were granted up to a week to return their newly-purchased Tesla vehicle if they were not satisfied. In the same announcement, Tesla said it would be shifting resources to improve its repair service systems, with the goal of providing same-day service to Tesla owners. However, auto dealers in several states, along with the National Automobile Dealers Association, remained dissatisfied with Tesla's online sales approach, noting that franchise laws in some states required dealers to have a physical presence in their state to sell online and that one of the main purposes of local franchising and licensing laws was to promote investment in an extensive network of independent, neighborhood new-car dealers.

Tesla expected that dealer associations in some states would continue to challenge the company's efforts to sell directly to customers and to own and operate its own retail and service locations, and Tesla management intended to actively fight such efforts. To sell vehicles to residents of states where the company could not be licensed as a dealer, Tesla made arrangements to conduct the transfer of title out of the state. In these states it also opened "galleries" that served the purpose of educating prospective buyers about Tesla products and how to obtain them (but such galleries did not take any orders for vehicles or perform any title transfer services).

Tesla Service Centers and Mobile Service Technicians. Tesla Roadster owners could upload data from their vehicle and send it to a service center on a memory card; all other Tesla owners had an on-board system that could communicate directly with a service center, allowing service technicians to diagnose and remedy many problems before ever looking at the vehicle. When maintenance or service was required, a customer could schedule service by contacting a Tesla service center or, in a growing

number of locations, use the Tesla mobile app to make arrangements to have service performed at their home, office, or other remote location by a Tesla Mobile Service technician who had the capability to perform a variety of services that did not require a vehicle lift. Some service locations offered valet service, where the owner's car was picked up, replaced with a well-equipped loaner car, and then returned when the service was completed—there was no additional charge for valet service. Mobile service technicians could perform most warranty repairs, but the cost of their visit was not covered under the New Vehicle Limited Warranty. Mobile service pricing was based on a per visit, per vehicle basis; there was a \$100 minimum charge per visit. Tesla's mobile service fleet consisted of 743 vehicles at year-end 2019, with coverage of all of North America. In early 2018, the company reported its mobile service fleet in North America was completing 30 percent of all service jobs at a cost below the average fees charged at its service centers.

Prepaid Maintenance Program. Initially, Tesla recommended that Model S, Model X, and Model 3 owners have an inspection every 12 months or 12,500 miles, whichever came first. Owners could purchase plans covering prepaid maintenance for three years or four years; these involved simply prepaying for service inspections at a discounted rate. All Tesla vehicles were protected by a 4-year or 50,000-mile (whichever came first) New Vehicle Limited Warranty, subject to separate limited warranties for the supplemental restraint system, battery and drive unit, and body rust perforation. For the battery and drive unit on new Model S and Model X vehicles, Tesla offered an eight-year, 150,000-mile limited warranty, with minimum 70 percent retention of battery capacity over the warranty period. For the battery and drive unit on new Model 3 and Model Y vehicles, Tesla offered an eight-year or 120,000-mile limited warranty for models with a Long Range or Performance battery, with minimum 70 percent retention of battery capacity over the warranty period.

In March 2019, after a fleetwide review of maintenance and repair records, Tesla decided to do away with its recommendations for scheduled *annual* maintenance for its vehicles because they were able to withstand longer-than-usual periods of time without regular maintenance when compared with traditional gasoline-powered vehicles. Effective immediately, Tesla ceased selling extended three- and four-year

prepaid maintenance plans and began recommending that owners bring their vehicles to a service center only when a specific component needed service. Owners who had already purchased extended three- and four-year service plans could request a refund of the remaining length of the plan. However, Tesla continued to recommend service intervals for certain components of its vehicles:

- Tire Rotation, Balance, and Wheel Alignment: 10,000–12,000 miles.
- Brake Fluid Test/Flush: 2 years.
- Cabin Air Filter: 2 years.
 - High-Efficiency Particulate Air (HEPA) Filter: 3 years (if equipped).
- Air Conditioning Service: 2 years (Model S), 4 years (Model X), 6 years (Model 3).
- Winter Care: Annually or every 12,500 miles for cars in cold weather climates.

Tesla's Supercharger Network: Providing Recharging Services to Owners on Long-Distance Trips.

A major component of Tesla's strategy to build rapidly-growing long-term demand for its vehicles was to make battery recharging while driving long distances convenient and worry-free for all Tesla vehicle owners. Tesla's solution to providing owners with ample and convenient recharging opportunities was to establish an extensive geographic network of recharging stations. Tesla's Supercharger stations were strategically placed along major highways connecting city centers, usually at locations with such nearby amenities as roadside diners, cafes, and shopping centers that enabled owners to have a brief rest stop or get a quick meal during the recharging process—about 90 percent of Model S and Model X buyers opted to have their vehicle equipped with supercharging capability when they ordered their vehicle. All Model S and Model X owners were entitled to *free* supercharging service at any of Tesla's Supercharging stations; Model 3 owners had to pay a recharging fee. In March 2018, Tesla announced price increases for its Supercharging stations to about \$0.25 per kWh. Tesla owners charged their vehicles at home more than 90 percent of the time and used Supercharger stations mainly for trips or when they needed extra range. A 50 percent recharge took 20 minutes, an 80 percent recharge took 40 minutes, and a 100 percent recharge took 75 minutes. As of year-end 2019, Tesla had a total of 1,821 Supercharger stations globally;

most Tesla stations had between 6 and 30 charging spaces, but newer stations in high-traffic corridors had as many as 50 spaces, a customer lounge, and a café.

Tesla executives did not expect Supercharger stations to ever become a profit center for the company; rather, they believed that the benefits of rapidly growing the size of the company's Supercharger network came from (1) relieving the "range anxiety" electric vehicle owners suffered when driving on a long-distance trip and (2) reducing the inconvenience to travelers of having to deviate from the shortest direct route and detour to the closest Supercharger station for needed recharging.

Technology and Product Development Strategy.

Heading into 2020, Tesla had spent \$6.9 billion on R&D activities to design, develop, test, and refine the components and systems needed to produce top quality electric vehicles and, further, to design and develop prototypes of the Tesla Roadster, Model S, Model X, Model 3, Model Y, Cybertruck, and Tesla Semi vehicles. Tesla executives believed its R&D activities had produced core competencies in battery and powertrain engineering and manufacturing. The company's core intellectual property was contained in its work on developing self-driving technologies and capabilities and in its electric powertrain technology (the battery pack, power electronics, induction motor, gearbox, and control software) that enabled these key components to operate as a system. Tesla personnel had designed each of these major elements for the Tesla Roadster and Model S; much of this technology had been used in the powertrain systems that Tesla previously had built for other vehicle manufacturers (mainly Toyota and Mercedes) and that had been further improved and refined in the powertrain systems being used in the Model X, Model 3, Model Y, and the prototypes for the Cybertruck and Tesla Semi.

The powertrain used in Tesla vehicles in 2020 was a compact, modular system with far fewer moving parts than the powertrains of traditional gasoline-powered vehicles, a feature that enabled Tesla to implement powertrain enhancements and improvements as fast as they could be identified, designed, and tested. Tesla had incorporated its latest powertrain technology into its current models and was planning to use much of this technology in producing forthcoming electric vehicles. All models included several

powertrain variants along with the latest advances in mobile computing, sensing, displays, and connectivity.

Although Tesla had more than 500 patents and pending patent applications domestically and internationally in a broad range of areas, in 2014, Tesla announced a patent policy whereby it irrevocably pledged the company would not initiate a lawsuit against any party for infringing Tesla's patents through activity relating to electric vehicles or related equipment so long as the party was acting in good faith. Elon Musk said the company made this pledge in order to encourage the advancement of a common, rapidly evolving platform for electric vehicles, thereby benefiting itself, other companies making electric vehicles, and the world. Investor reaction to this announcement was largely negative on grounds that it would negate any technology-based competitive advantage over rival manufacturers of electric vehicles.

Battery Pack. In February 2014, Tesla announced that it and various partners, principally Panasonic—Tesla's supplier of lithium-ion batteries since 2010—would invest \$4 to 5 billion through 2020 in a "gigafactory" capable of producing enough lithium-ion batteries to make battery packs for 500,000 vehicles. Tesla expected the new plant (named the Tesla Gigafactory, later changed to Gigafactory 1) to reduce the company's battery pack cost by more than 30 percent—battery packs were the most expensive component in the company's electric vehicles.

Tesla opted to locate Gigafactory 1 on a site in an industrial park east of Reno, Nevada, partly because the state of Nevada offered Tesla a lucrative incentive package said to be worth \$1.25 billion over 20 years and partly because the only commercially active lithium mining operation in the United States was in a nearby Nevada county (this county was reputed to have the fifth largest deposit of lithium in the world). Construction began immediately. The facility was built in phases. In 2019, Tesla announced it would continue expanding Gigafactory 1 over the next few years so that its battery-making capacity would significantly exceed the volume needed for 500,000 vehicles per year when construction first started. Tesla had already added space at Gigafactory 1 to enable the manufacture of Tesla Energy's primary energy storage products (Powerwall, Powerpack, and Megapack) and the manufacture of Model 3 and Model Y drive units.

During 2015–2017, Tesla, in close collaboration with Panasonic, discovered ways to build an improved lithium-ion battery that would be larger, safer, and require fewer individual batteries per battery pack. The new battery was being used in the Model 3 and Model Y vehicles produced at the Fremont factory in California. However, in August 2019, Tesla agreed to purchase lithium-ion batteries from LG Chem, a South Korean firm with a battery-making plant in China about 200 miles from Shanghai, that would be used to manufacture the battery packs for the Model 3 and Model Y vehicles produced at the new Shanghai plant—LG Chem was the world's second-largest manufacturer of lithium-ion battery cells. Earlier in 2019 Tesla acquired Maxwell Technologies, a maker of ultracapacitors—energy storage devices that could charge and discharge rapidly, perform at a wide range of temperatures, had high power density, and long operational life; Maxwell's dry electrode technology could be applied to batteries of varying chemistries and offered the advantages of higher battery performance at a lower cost.

Going forward, Tesla believed it had the capabilities to quickly incorporate the latest advancements in battery technology and continue to optimize battery pack system performance and cost for its current and future vehicles. It already had proprietary technology and expertise in optimizing the design of the lithium-ion cells used in its battery packs and in achieving high energy density in its battery packs at progressively lower cost, while also maintaining safety, reliability, and long life. In addition, its proprietary technological know-how included capabilities relating to systems for high density energy storage, cooling, charge balancing, structural durability, and electronics management. Tesla had pioneered and then continuously refined its advanced manufacturing techniques to produce large quantities of high-quality battery packs at progressively lower cost per unit. Plus, it had extensive testing and R&D capabilities for battery cells, packs, and systems, along with an expansive body of knowledge on lithium-ion cell chemistry types, their performance characteristics, and lithium-ion cell vendors.

Power Electronics. The power electronics in Tesla's powertrain system had two primary functions—the control of torque generation in the electric motor while driving and the control of energy delivery back into the battery pack while charging. The first function was accomplished through the

drive inverter, which converted direct current from the battery pack into alternating current to power the electric motors, provide acceleration, and enhance the overall driving performance of the vehicle. The second function was to capture kinetic energy from the wheels being in motion but being slowed down by applying the brakes and reverse the flow of energy to help recharge the battery pack—a technology called “regenerative braking.” (When brakes are applied in gasoline-powered vehicles, the brake pads clamp down on the wheels to slow the vehicle (letting the kinetic energy escape as heat); but in electric vehicles (and most hybrid vehicles), the regenerative braking systems slow the vehicle by reversing the flow of electricity to the electric motors powering the wheels, while also capturing the heat from the kinetic energy to generate electrical energy for partially recharging the battery pack.) When the electric vehicle was parked, battery recharging was accomplished by the vehicle's charger, which converted alternating current (usually from a wall outlet or other electricity source) into direct current which could be accepted by the battery. The primary technological advantages to Tesla's proprietary power electronics designs included the ability to drive large amounts of electrical current into a small physical package with high efficiency and low cost, and to recharge on a wide variety of electricity sources at home, at the office or on the road, including at Tesla's network of Supercharger stations.

As of March 2020, all of Tesla's models utilized an all-wheel drive powertrain with two electric motors: one mounted on the front axle and one on the rear axle. Tesla's powertrain design digitally and independently controlled torque to the front and rear wheels, which resulted in the vehicle having a low center of gravity and enabled near-instantaneous response of the motors to the driver's placing more or less pressure on the accelerator. These design features produced greater traction control and gave drivers more control of the vehicle's performance. Tesla engineers were engaged in developing a three-motor powertrain that would provide further increases in performance.

Control and Infotainment Software. The battery pack and the performance and safety systems of Tesla vehicles required the use of numerous microprocessors and sophisticated software. For example, computer-driven software monitored the charge state of each of the cells of the battery pack and

managed all of the safety systems. The flow of electricity between the battery pack and the motor had to be tightly controlled in order to deliver the best possible performance and driving experience. There were software algorithms that enabled the vehicle to mimic the “creep” feeling that drivers expected from an internal combustion engine vehicle without having to apply pressure on the accelerator. Other algorithms were used to control traction, vehicle stability, acceleration, regenerative braking, and the interior climate. Drivers used the vehicle’s information and control systems to optimize performance, customize vehicle behavior, manage charging modes and times, and control all infotainment functions. Almost all of the software programs had been developed and written by Tesla personnel.

Starting in 2014, Tesla began devoting progressively larger fractions of its programming resources and expertise to developing and enhancing its software for vehicle autopilot functionality, including such features as auto-steering, traffic-aware cruise control, automated lane changing, automated parking, driver warning systems, automated braking, object detection, a Smart Summons feature that enabled vehicles to be remotely summoned over short distances in parking lots and driveways, and fully-automated self-driving. In October 2016, Tesla began equipping all models with hardware needed for full self-driving capability, including cameras that provided 360-degree visibility, updated ultrasonic sensors for object detection, a forward-facing radar with enhanced processing, and a powerful onboard computer. Wireless software updates periodically sent to the microprocessors on board each Tesla owner’s vehicle, together with field data feedback loops from the onboard camera, radar, ultrasonic sensors, and GPS, enabled the autopilot system in Tesla vehicles to continually learn and improve its performance. In 2019, Elon Musk said he expected Tesla’s autopilot software to be able to handle all modes of driving within two years.

Vehicle Design and Engineering. Tesla had devoted considerable effort to creating significant in-house capabilities related to designing and engineering portions of its vehicles, and it had become knowledgeable about the design and engineering of those parts, components, and systems that it purchased from suppliers. Tesla personnel had designed and engineered the body, chassis, and interior of its current models.

As a matter of necessity, Tesla was forced to redesign the heating, cooling, and ventilation system for its electric vehicles to operate without the energy generated from an internal combustion engine and to integrate with its own battery-powered thermal management system. In addition, the low-voltage electric system that powered the radio, power windows, and heated seats had to be designed specifically for use in an electric vehicle. Tesla had developed expertise in integrating these components with the high-voltage power source in its vehicles and in designing components that significantly reduced their load on the vehicle’s battery pack, so as to maximize the available driving range. All Tesla vehicles incorporated the latest advances in mobile computing, sensing, displays, and connectivity.

Tesla personnel had accumulated considerable expertise in lightweight materials, since an electric vehicle’s driving range was heavily impacted by the vehicle’s weight and mass. The Tesla Roadster had been built with an in-house designed carbon fiber body to provide a good balance of strength and mass. The Model S and Model X had a lightweight aluminum body and a chassis that incorporated a variety of materials and production methods to help optimize vehicle weight, strength, safety, and performance. Weight reduction was an important factor in the design of the Model 3 and Model Y. In addition, top management believed that the company’s design and engineering team had core competencies in computer-aided design and crash test simulations; this expertise had reduced the development time of new models. Tesla was continuing to strengthen its capabilities for on-site crash-testing, durability testing, and validation of components from suppliers.

Manufacturing Strategy.

Tesla had contracted with Lotus Cars, Ltd. to produce Tesla Roadster “gliders” (a complete vehicle minus the electric powertrain) at a Lotus factory in Hethel, England. The Tesla gliders were then shipped to a Tesla facility in Menlo Park, California, where the battery pack, induction motors, and other powertrain components were installed as part of the final assembly process. The production of Roadster gliders ceased in January 2012.

In May 2010, Tesla purchased the major portion of a recently closed automobile plant in Fremont, California, for \$42 million; months later, Tesla purchased some of the plant’s equipment for \$17 million.

The facility—formerly a General Motors manufacturing plant (1960–1982), then operated as a joint venture between General Motors and Toyota (1984–2010)—was closed in 2010. Tesla executives viewed the facility as one of the largest, most advanced, and cleanest automotive production plants in the world. The 5.3 million square feet of manufacturing and office space was deemed sufficient for Tesla to produce about 500,000 vehicles annually (approximately 1 percent of the total worldwide car production), thus giving Tesla room to grow its output of electric vehicles to 500,000 or more vehicles annually. The Fremont plant's location in the northern section of Silicon Valley facilitated hiring talented engineers already residing nearby and because the short distance between Fremont and Tesla's Palo Alto headquarters ensured “a tight feedback loop between vehicle engineering, manufacturing, and other divisions within the company.”²⁶ Tesla officially took possession of the 370-acre site in October 2010, renamed it the Tesla Factory, and immediately launched efforts to get a portion of the massive facility ready to begin manufacturing components and assembling the Model S in 2012.

In late 2015, Tesla completed construction of a new high-volume paint shop and a new body shop line capable of turning out 3,500 Model S and Model X bodies per week (enough for 175,000 vehicles annually). In 2016 and 2017, Tesla made significant additional investments at the Tesla Factory, including a new body shop with space and equipment for Model 3 final assembly. Tesla expected the Fremont facility, together with a neighboring 500,000-square-foot building that Tesla had leased, would be expanded to 10 million square feet in the coming years.

In December 2012, Tesla opened a new 60,000-square-foot facility in Tilburg, Netherlands, about 50 miles from the port of Rotterdam, to serve as the final assembly and distribution point for all Tesla vehicles sold in Europe and Scandinavia. The facility, called the Tilburg Assembly Plant, received nearly complete vehicles shipped from the Tesla Factory, performed certain final assembly activities, conducted final vehicle testing, and handled the delivery to customers across Europe. It also functioned as Tesla's European service and parts headquarters. Tilburg's central location and its excellent rail and highway network to all major markets on the European continent allowed Tesla to distribute to anywhere across the continent in about 12 hours. The Tilburg

operation had been expanded to over 200,000 square feet in order to accommodate a parts distribution warehouse for service centers throughout Europe, a center for remanufacturing work, and a customer service center. A nearby facility in Amsterdam provided corporate oversight for European sales, service, and administrative functions.

Tesla's manufacturing strategy was to source a number of parts and components from outside suppliers but to design, develop, and manufacture in-house those key components where it had considerable intellectual property and core competencies (namely lithium-ion battery packs, electric motors, gearboxes, and other powertrain components) and to perform all assembly-related activities itself. In 2018–2020, the Tesla Factory contained several production-related activities, including stamping, machining, casting, plastics molding, drive unit production for the Model S and Model X, robotics-assisted body assembly, paint operations, final vehicle assembly, and end-of-line quality testing. In addition, the Tesla Factory manufactured lithium-ion battery packs, electric motors, gearboxes, and certain other components for its Model S and Model X vehicles. While some major vehicle component systems were purchased from suppliers, there was a high level of vertical integration in the manufacturing processes at the Tesla Factory in 2018–2019. From 2016 to 2019, efforts to expand production capacity at the Tesla Factory were ongoing, partly to accommodate production of the Model S and Model X but mainly to enable high volume production of the Model 3 and Model Y.

In 2014, Tesla began producing and machining various aluminum components at a 431,000-square-foot facility in Lathrop, California; an aluminum castings operation was added in 2016. Aluminum parts and components were used extensively to help reduce the weight of Tesla vehicles.

Tesla had encountered a number of unexpected quality problems in the first two to three months of manufacturing the Model X. Getting the complicated hinges on the falcon-wing doors to function properly proved to be particularly troublesome. Customers who received the first wave of Model X deliveries also reported problems with the front doors and windows and with the 17-inch dashboard touchscreen freezing (a major problem because so many functions were controlled from this screen). Most of these problems were largely resolved by mid-2016, although Model X owners rated the reliability of their vehicles

significantly lower than Model S owners—the chief culprit was the falcon-wing doors, which reportedly had generated significant warranty claims and warranty costs. Weekly production volumes of the Model X rose steadily in the second half of 2016.

Musk believed Tesla had learned valuable manufacturing lessons that could be applied in ramping up the production volume of the Model 3 at the Fremont plant. These lessons had driven refinements in the production and assembly lines for the Model S, Model X, and Model 3 at the Fremont plant and had been incorporated into designing and equipping the new Shanghai Gigafactory that began construction in early 2019 and production in early 2020. The first-generation production line for the Model 3 in Shanghai was Tesla's first step in building a manufacturing platform that could be replicated quickly and cost efficiently across all vehicle types and in different geographic locations. Design and construction of a second production line in Shanghai were already underway to add Model Y manufacturing capacity, and expectations were that the second production line would be at least 50 percent cheaper per unit of capacity than the current Model 3-related assembly lines in Fremont.²⁷ Major gains in production efficiency and approximately 50 percent lower unit costs for the Model 3 were expected when production of the Model 3 ramped up in the new production facility in Shanghai where Tesla was installing a much-simplified production process and increasing use of robot-assisted assembly. Production costs for Model Y vehicles at the Shanghai Gigafactory were expected to be even lower than those for Model 3.

Supply Chain Strategy.

Tesla's various models used thousands of parts and components sourced from hundreds of suppliers across the world. Certain components purchased from these suppliers were either identical or very similar across the company's growing number of models, which opened opportunities for volume-based price reductions and related cost-saving efficiencies. Tesla worked to qualify multiple suppliers for each such component where it was sensible to do so, **in order to reduce the bargaining power of any one supplier and to minimize production risks associated with being dependent on a single supply source.** In many cases, however, components and systems were sourced from single suppliers. In such cases, the company mitigated single-source supply risk by maintaining safety

stocks for key parts and assemblies and die banks for components with lengthy procurement lead times. But in some instances (like lithium-ion battery cells, battery packs, and drive trains), the company opted to produce needed parts and components internally.

Tesla's products also required purchasing such raw materials as steel, aluminum, cobalt, lithium, nickel, and copper. Pricing for these materials was governed by market supply and demand conditions, and sometimes by the activities of speculators—factors outside of the company's control. Management believed that, while the company was vulnerable to periodic spikes in the prices of particular raw materials, it nonetheless had sufficiently adequate access to supplies of raw materials to meet the needs of its operations.

Marketing Strategy.

From 2014 through year-end 2019, Tesla's principal marketing goals and functions were to:

- Work with interested buyers as needed either in sales galleries or online to arrange for a test drive, view existing inventories at nearby sites, or place an order for a custom-equipped vehicle.
- Build long-term brand awareness and manage the company's image and reputation.
- Develop and nurture brand loyalty among existing owners of Tesla vehicles and help generate customer referrals.
- Obtain feedback from the owners of Tesla vehicles and make sure their experiences and suggestions for improvement were communicated to Tesla personnel engaged in designing, developing, and/or improving the company's current and future vehicles.

As the first company to commercially produce a federally-compliant, fully electric vehicle that achieved market-leading range on a single charge, Tesla had been able to generate significant media coverage of the company and its vehicles. Management expected this would continue for some time to come. So far, the extensive media coverage, largely favorable reviews in motor vehicle publications and *Consumer Reports*, praise from owners of Tesla vehicles and admiring car enthusiasts (which enlarged Tesla's sales force at zero cost), and the decisions of many green-minded affluent individuals to help lead the movement away from gasoline-powered vehicles had all combined to drive good traffic flows at Tesla's sales galleries and create a flow of online orders and pre-production reservations. As a

consequence, starting in 2012 and continuing into early 2020, Tesla had achieved a growing volume of sales without traditional advertising and at relatively low marketing costs. Nonetheless, Tesla did make use of pay-per-click advertisements on websites and mobile applications relevant to its target clientele. It also displayed and demonstrated its vehicles at such widely attended public events as the Detroit, Los Angeles, and Frankfurt auto shows.

Tesla's Leasing Activities.

Tesla, in partnership with various financial institutions, began leasing vehicles to customers in 2014; the number and percentage of customers opting to lease Model S vehicles increased substantially in 2015. By year-end 2015, Tesla was not only offering loans and leases in North America, Europe, and Asia through its various partner financial institutions, but it was also offering loans and leases directly through its own captive finance subsidiaries in certain areas of the United States, Germany, Canada, and Great Britain.

Some of Tesla's financing programs outside of North America in 2015–2017 provided customers with a resale value guarantee under which those customers had the option of selling their vehicle back to Tesla at a preset future date, generally at the end of the term of the applicable loan or financing program, for a pre-determined resale value. In certain markets, Tesla also offered vehicle buyback guarantees to financial institutions that could obligate Tesla to repurchase the vehicles for a predetermined price. These programs, when first introduced in 2015 and 2016 had been widely publicized and attracted numerous buyers, but Tesla determined in late 2016 and 2017 to back away from these offers in most countries because they were proving unprofitable, had unattractive accounting requirements, and exposed Tesla to the risk that the vehicles' resale value could be lower than its estimates and also to the risk that the volume of vehicles sold back to Tesla at the guaranteed resale price might be higher than the company's estimates—such risks had to be accounted for by establishing a contingent liability (in the current liabilities section of the balance sheet) deemed sufficient to cover these risks.

Sales of Regulatory Credits to Other Automotive Manufacturers.

Because Tesla's electric vehicles had no tailpipe emissions of greenhouse gases or other pollutants, Tesla earned zero-emission vehicle (ZEV) and greenhouse gas (GHG) credits on each vehicle sold in the United

States. Moreover, it also earned corporate average fuel economy (CAFE) credits on its sales of vehicles because of their high equivalent miles per gallon ratings. All three of these types of regulatory credits had significant market value because the manufacturers of traditional gasoline-powered vehicles were subject to assorted emission and mileage requirements set by the U.S. Environmental Protection Agency (EPA) and by certain state agencies charged with protecting the environment within their borders; automotive manufacturers whose vehicle sales did not meet prevailing emission and mileage requirements were allowed to achieve compliance by purchasing credits earned by other automotive manufacturers. Tesla had entered into contracts for the sale of ZEV and GHG credits with several automotive manufacturers, and it also routinely sold its CAFE credits. Tesla's sales of ZEV, GHG, and CAFE credits produced revenues of \$594 million in 2019, \$419 million in 2018, \$360 million in 2017, \$302 million in 2016, and \$169 million in 2015. In Exhibit 2, these amounts were included on Tesla's income statement in the revenue category labeled "Automotive sales;" without these revenues, as frequently noted by Wall Street analysts, Tesla's losses in 2015 through 2019 would have been significantly higher.

Tesla and the COVID-19 Pandemic.

Tesla's deliveries of its Model 3 and Model Y vehicles in both Q1 and Q2 of 2020 were below expectations at the beginning of 2020, partly because of closure of its Gigafactory 2 in Shanghai for 2 weeks in Q1 (January 30 to February 10) that was mandated by the Chinese government as part of its campaign to limit the spread of the COVID-19 virus and partly because of California-mandated closure of the Fremont plant starting March 24 that extended until May 13, 2020, at which time limited production was allowed, provided California and Alameda County health and safety measures were strictly observed (Tesla's observance of these measures was periodically checked by Alameda County police). Tesla also experienced scaled-back battery production at its battery Gigafactory in Nevada for almost 50 percent of Q1 and then production was suspended entirely for two weeks starting March 26, which was then extended until May 4, 2020, as part of governmental efforts to contain the spread of the coronavirus. In June 2020, limited production at the Fremont plant and Nevada Gigafactory was resuming but the

wearing of masks and social distancing were required of production workers.

Tesla Energy in 2020

In 2015, Tesla formed Tesla Energy, a new subsidiary that would begin producing and selling two energy storage products in 2016—Powerwall for homeowners and Powerpack for industrial, commercial, and utility customers. Powerwall was a lithium-ion battery charged either by electricity generated from a home's solar panels or from power company sources when electric rates were low. Powerwall home batteries could also be used as a backup power source in case of unexpected power outages. Powerpack models were rechargeable lithium-ion batteries that industrial, commercial, and utility enterprises could use for energy storage or backup power.

Production and deliveries of second-generation Powerwall 2 and Powerpack 2 began in late 2016. Both products had the capability to receive over-the-air firmware and software updates that enabled additional features. In 2018–2020, these two energy storage products were being used for backup power, independence from utility grids, peak demand reduction, generating power to cover periods when solar and/or wind generating sources were unavailable, and supplying wholesale electricity to select customers.

When Solar Energy was merged into Tesla, the company arranged to lease a facility, called Gigafactory 2, in Buffalo, New York, to produce (1) solar energy systems sold to residential and commercial customers and (2) its freshly-developed Solar Roof, which used aesthetically pleasing and durable glass roofing tiles designed to complement the architecture of homes and commercial buildings, to turn sunlight into electricity. A third-generation Solar Roof was introduced in 2019 that was marketed directly to residential customers and through an assortment of distribution partners. Installation capabilities had been enhanced by training both company personnel and the installers of third-party partners. To facilitate the growth of its solar roof business, Tesla Energy had developed proprietary software to reduce solar energy system design and installation timelines and costs and had also designed the new generation of the Solar Roof to work seamlessly with its Powerwall product.

Tesla Energy's solar energy systems included solar panels that convert sunlight into electrical

current, inverters that convert the electrical output from the panels to a usable current compatible with the electric grid, racking that attaches the solar panels to the roof or ground, electrical hardware that connect the solar energy system to the electric grid, and a monitoring device. The majority of the components were purchased from vendors; the company maintained multiple sources for each major component to ensure competitive pricing and adequate supplies.

Tesla Energy had an in-house engineering team that designed its energy storage products and solar roof systems. Whenever feasible, the engineering team utilized component-level technologies developed for its electric vehicles (particularly high-density energy storage, cooling, safety, charge balancing, structural durability, and electronics management) to enhance the capabilities and features of its energy storage and solar roof products. While a majority of the components in the division's energy storage and solar roof products were obtained from multiple outside sources, some solar roof components were designed and manufactured at the Gigafactory in New York.

In the United States, Tesla Energy sold its solar and energy storage products through its website and sales galleries as well as through its national sales organization, channel partner network, and customer referral program. Outside the United States, Tesla Energy used its international sales organization and a network of channel partners to market and sell Powerwall 2 to residential customers; some Powerwall 2 units were sold directly to utilities, who then installed the product in customer homes. Powerpack and Megapack systems were sold to commercial and utility customers through its international sales organization.

In December 2017, Tesla completed installation of a 100-megawatt lithium-ion battery hooked into the electricity grid in South Australia to relieve power shortages created by a tornado in 2016. Elon Musk had promised that once the contract was signed, Tesla would complete the project in 100 days or it would be furnished free of charge—Tesla completed the installation in 60 days. According to Musk, the battery was three times more powerful than the world's next biggest battery. In late 2019 Tesla Energy began selling a Megapack product, multiple units of which could be grouped together to form energy generating and energy storage installations big enough to supply the

needs of large industrial customers, utilities, energy generation firms, communities, and large neighborhoods. In 2019, Tesla Energy deployed more than 1.65 Gigawatt hours of energy storage systems, an amount greater than in all previous years combined.

Tesla's revenues from energy generation and storage products were \$1.1 billion in 2017, \$1.6 billion in 2018, and \$1.5 billion in 2019 (Exhibit 2), resulting in gross profits of \$242 million in 2017, \$190 million in 2018, and \$190 million in 2019. Elon Musk was very optimistic about the growth opportunities for Tesla Energy, but Tesla's financial reporting did not reveal whether Tesla Energy's operations were generating positive or negative operating profit margins.

The Electric Vehicle Segment of the Global Automotive Industry

Global sales of passenger cars and SUVs totaled 79.6 million units in 2017, 78.9 million units in 2018, and 75 million units in 2019. Sales of other types of vehicles (light or pickup trucks, heavy or cargo-carrying

trucks, recreational vehicles, buses, and minibuses) totaled 26.9 million in 2019 versus 26.6 million in 2018. In 2019, global sales of plug-in electric vehicles totaled 2.2 million units, up from 2.0 million in 2018. million—plug-in vehicles included both battery-only vehicles and so-called plug-in hybrid electric vehicles equipped with a gasoline or diesel engine for use when the vehicle's battery pack (rechargeable only from an external plug-in source) was depleted, usually after a distance of 20 to 50 miles. Hybrid vehicles were jointly powered by an internal combustion engine and an electric motor that ran on batteries charged by regenerative braking and the internal combustion engine; the batteries in a hybrid vehicle could not be restored to a full charge by connecting a plug to an external power source. Exhibit 3 shows the best-selling plug-in electric vehicles in the United States from 2013 through 2019. Exhibit 4 shows the world's 20 largest manufacturers of electric vehicles in 2019, along with the 20 best-selling models of electric vehicles in 2019. More electric vehicles were manufactured in China than in any other country in

EXHIBIT 3 Sales of Best-Selling Plug-in Electric Vehicles in the United States, 2014–2019

Best-Selling Models	2014	2015	2016	2017	2018	2019
Tesla Model 3*				1,764	139,782	158,925
Toyota Prius PHV/Prime	13,264	4,191	2,474	20,963	27,595	23,630
Tesla Model X*		214	18,223	21,315	26,100	19,225
Chevrolet Bolt EV*			579	23,297	18,019	16,418
Tesla Model S*	17,300	25,202	28,896	27,060	25,745	14,100
Nissan Leaf*	30,200	17,269	14,006	11,230	14,715	12,365
Honda Clarity PHEV					18,602	10,728
Ford Fusion Energi	11,550	9,750	15,938	9,632	8,074	7,524
BMW 530e				3,772	8,664	5,862
Chrysler Pacifica Hybrid				4,597	7,062	5,723
Audi e-tron*						5,369
Chevrolet Volt	18,805	15,393	24,739	20,349	18,306	4,910
Volkswagen e-Golf*			3,937	3,534	1,354	4,863
BMW i3*	6,092	11,024	7,625	6,276	6,117	4,854
Kia Niro PHEV					3,389	3,881
All Others	12,243	19,532	32,847	41,701	37,783	31,151
United States Total	123,049	116,099	158,614	199,826	361,307	329,528
Worldwide	320,713	550,297	777,497	1,227,117	2,018,247	2,209,831

*Battery-operated.

Source: Inside EVs, "Monthly Plug-in Sales Scorecard," www.insideevs.com (accessed March 5, 2018, June 4, 2019, and March 19, 2020).

EXHIBIT 4 Global Electric Vehicle Sales of Top 20 Manufacturers of Electric Vehicles and Top 20 Best-Selling Models of Electric Vehicles, 2019

Rank	Leading Manufacturers	2019 Unit Sales	Best-Selling Vehicle Models	2019 Unit Sales
1	Tesla	367,820	Tesla Model 3	300,075
2	BYD (China)	229,506	BAIC EU-Series	111,047
3	BAIC (China)	160,251	Nissan Leaf	69,873
4	SAIC (China)	137,666	BYD Yuan/52 EV	67,839
5	BMW (Germany)	128,883	SAIC Baojun E-Series	60,050
6	Volkswagen (Germany)	84,199	BMW 530e/Le	51,083
7	Nissan (Japan)	80,545	Mitsubishi Outlander PHEV	49,649
8	Geely (China)	75,869	Renault Zoe	46,839
9	Hyundai (South Korea)	72,959	Hyundai Kona EV	44,386
10	Toyota (Japan)	55,155	BMW i3	41,837
11	Kia (South Korea)	53,477	Tesla Model X	39,497
12	Mitsubishi (Japan)	52,145	Chery eQ EV	39,401
13	Renault (France)	50,609	Toyota Prius PHEV	38,201
14	Chery (China)	48,395	Volkswagen e-Golf	36,016
15	GAC (China)	46,695	BYD Tang PHEV	34,084
16	Volvo (Sweden)	45,933	GAC Aion S	32,126
17	Great Wall (China)	41,627	SAIC Roewe EIS EV	30,550
18	Dongfeng (China)	39,861	BYD e5	29,311
19	Chang'an Automobile (China)	38,793	Geely Emgrand EV	28,958
20	JAC (China)	34,494	Tesla Model S	28,248
	All others	732,769	All others	1,030,761

Source: Mark Kane, "Global EV Sales for 2019," www.insideevs.com, February 2, 2020 (accessed March 19, 2020).

the world, and China was the world's largest market for motor vehicles, with 2019 sales of 25.8 million units, down from 28.8 million units in 2017 and 28.1 million units in 2018. Europe was the world's second largest market for electric vehicles.

There was no question in 2020 and beyond that Tesla was faced with intensifying competition in the global marketplace for electric-powered vehicles. Virtually every motor vehicle manufacturer in the world was introducing new battery-powered electric vehicles, most with driving ranges of 200 miles or more. In 2018 and 2019, models with 200+ mile driving ranges had been introduced by Audi, Jaguar, Mercedes, Kia, Volvo, General Motors, and Hyundai. Fresh models from Porsche, Aston Martin, Nissan, Audi, Volkswagen, BMW, General Motors, and Ford came on the market in 2020. Sales of a second-generation Nissan Leaf with a driving range of up to 150 miles began in January 2018. At year-end 2018, there

were 43 models of electric powered vehicles being sold in the United States, with annual sales totaling just over 361,000 units. However, in the United States 2019 sales of electric vehicles dropped nearly 9 percent to 329,500 vehicles as many new vehicle buyers opted for well-equipped SUVs and pickup trucks.

In 2018 Volkswagen announced plans to equip 16 factories to produce electric vehicles by the end of 2022, compared with three currently, and to build as many as 3 million electric cars per year by 2025. In December 2017, Toyota said by around 2025, every Toyota and Lexus model sold around the world would be available either as a dedicated electrified model or have an electrified option. Additionally, Toyota expected to have annual sales of more than 5.5 million electrified vehicles by 2030 (including more than 1 million zero-emission vehicles totally powered by either batteries or fuel cells) and to halt all production of gasoline-powered vehicles by 2040. In 2018,

the government of Germany launched a campaign to put one million electric cars on its roads by 2020 and to have 40 percent electric cars on its roads by 2035.

Hydrogen Fuel Cells: An Alternative to Electric Batteries.

Many of the world's major automotive manufacturers, while actively working on next-generation battery-powered electric vehicles, were nonetheless hedging their bets by also pursuing the development of hydrogen fuel cells as an alternative means of powering future vehicles. **Toyota was considered the leader in developing hydrogen fuel cells and was sharing some of its fuel-cell technology patents for free with other automotive companies in an effort to spur whether there was merit in installing fuel cells and building out a hydrogen charging network.** Audi,

Honda, Toyota, Mercedes-Benz, and Hyundai had recently introduced first-generation models powered by hydrogen fuel cells.²⁸

Hydrogen fuel cells could be refueled with hydrogen in three to five minutes. California and several states in the northeastern United States already had a number of hydrogen refueling stations. Existing gasoline stations could add hydrogen refueling capability at a cost of about \$1.5 million. A full tank of hydrogen provided vehicles with a driving range of about 310 miles. While battery-powered vehicles were currently cheaper than fuel-cell powered vehicles, experts expected that cheaper materials, more efficient fuel cells, and scale economies would in upcoming years enable producers of fuel-cell vehicles to match the prices of battery-powered electric vehicles.

ENDNOTES

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